MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

PEM0044 – ESSENTIAL MATHEMATICS

(All sections / Groups)

05 MARCH 2018
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **FOUR (4)** printed pages with 4 questions only, excluding the cover page.

2. Answer all **FOUR (4)** questions.

3. Write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.

4. The formula sheet is attached at the end of this question paper.

Question 1 (25 Marks)

(a) Simplify the following expression.

$$\left[\left(\frac{8a^4b^6}{2a^2}\right)^{-2}\right]^2$$

[5 marks]

(b) Solve the following equation and inequality.

(i) $3^{3m-1}9^{m-1}=81^{2m}$

[5 marks]

(ii) $3+\frac{x-2}{4}\leq\frac{x+1}{3}$

[7 marks]

(c) Find an equation of the straight line that passes through point (7, -5) and is parallel to the line $3x+y=4$. Next, sketch the line of the new equation.

[8 marks]

Question 2 (25 Marks)

(a) Given that $A=\begin{bmatrix}2 & 1\\ -1 & 3\\ -2 & 2\end{bmatrix}$ and $B=\begin{bmatrix}2 & 1\\ 0 & 3\end{bmatrix}$. Show that $(AB)^T=B^TA^T$.

[7 marks]

(b) Solve the following system of linear equations using the inverse of the coefficient matrix:

$$x+2y+4z=2$$
$$2y+z=1$$
$$x+2y+2z=4$$

[18 marks]

Continued...

Question 3 (20 Marks)

(a) Given the arithmetic sequence 9, 14, 19, 24, ...

(i) Find the first term and the common difference.

[4 marks]

(ii) Given the n^{th} term is 79. Find the value of n.

[4 marks]

(iii) Find the sum of the first 30 terms.

[5 marks]

(b) Common ratio of a geometric progression is a positive number. Given the sixth term, $a_6 = 160$ and the tenth term, $a_{10} = 2560$. Find the first term, a and the common ratio, r.

[7 marks]

Question 4 (30 Marks)

(a) Find $f'(x)$ if $f(x) = 4x^3 - 2x^2 + \frac{3}{x^3} - 5$.

[4 marks]

(b) Using quotient rule, find $f'(x)$ if $f(x) = \frac{x^2 - 4x + 5}{2x + 7}$.

[6 marks]

(c) Find $\frac{dy}{dx}$ for the following function by using the power rule.

$$y = \left(-6x^{\frac{2}{3}} + 2x \right)^{\frac{1}{4}}$$

[4 marks]

Continued...

(d) Evaluate each of the following integrals:

(i) $\int\left(-x^3+\frac{1}{2}x^2-2\sqrt[3]{x}+6\right)dx$

[4 marks]

(ii) $\int\frac{2-4t^{-2}}{2t^4}\,dt$

[4 marks]

(iii) $\int_{\sqrt{3}}^{2}x^3\left(x^4-5\right)^{\frac{1}{3}}dx$

[8 marks]

End of Page.

Course: Essential Mathematics
Code: PEM0044

Summary of Formulas

1. Basic Rules of Differentiation

i) $f'(x)=0$
ii) $f'(x)=nx^{n-1}$
iii) $cf(x)=cf'(x)$
iv) $f(x)\pm g(x)=f'(x)\pm g'(x)$
v) $f'(x)=u\dfrac{dv}{dx}+v\dfrac{du}{dx}$
vi) $f'(x)=\dfrac{v\dfrac{du}{dx}-u\dfrac{dv}{dx}}{[v]^2}$
vii) Chain rule: $\dfrac{dy}{dx}=\dfrac{dy}{du}\times\dfrac{du}{dx}$
viii) General power rule: Derive $[f(x)]^n=n[f(x)]^{n-1}f'(x)$

2. Basic Rules of Integration

i) $\int k\ du=ku+C$
ii) $\int u^n du=\dfrac{u^{n+1}}{n+1}+C$
iii) $\int kf(u)\ du=k\int f(u)\ du$
iv) $\int[f(u)\pm g(u)]\ du=\int f(u)du+\int g(u)du$